DEFENSE INFORMATION SYSTEMS AGENCY
P. O. BOX 549
FORT MEADE, MARYLAND 20755-0549

IN REPLY
REFER TO: Joint Interoperability Test Command (JTE)

MEMORANDUM FOR DISTRIBUTION   **27 Apr 11**

SUBJECT: Special Interoperability Test Certification of the Brocade NetIron Carrier Ethernet Router (CER)/Carrier Ethernet Switch (CES) Series Release 5.1.01

References: (a) DoD Directive 4630.05, "Interoperability and Supportability of Information Technology (IT) and National Security Systems (NSS)," 5 May 2004
(b) CJCSI 6212.01E, "Interoperability and Supportability of Information Technology and National Security Systems," 15 December 2008
(c) through (g), see Enclosure 1

1. References (a) and (b) establish the Joint Interoperability Test Command (JITC), as the responsible organization for interoperability test certification.

2. The Brocade NetIron NI-CER-2048CX-ADVPREM-AC Release 5.1.01 is hereinafter referred to as the System Under Test (SUT). The SUT meets all of its critical interoperability requirements and is certified for joint use within the Defense Information System Network (DISN) as an Assured Services Local Area Network (ASLAN) Distribution and Access Layer switch. The SUT is certified as interoperable for joint use with other ASLAN components listed on the Unified Capabilities (UC) Approved Products List (APL) with the following interfaces: 10000Base SX/LX and 100/1000BaseFX. The SUT meets the critical interoperability requirements set forth in Reference (c), using test procedures derived from Reference (d). The Brocade NetIron CER/CES Series switches listed in the UC APL Product Summary, Table 1, employ the same software and hardware as the SUT. The JITC analysis determined these systems to be functionally identical to the SUT for interoperability certification purposes and they are also certified for joint use.

Table 1. UC APL Product Summary

Component (See note.)	Release	Sub-Component	Certification Applicability		
			Core	Distribution	Access
Brocade NetIron NI-CER-2048CX-ADVPREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2024C-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2024C-ADVPREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2024C-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2024C-ADVPREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2024F-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2024F-ADVPREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2024F-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2024F-ADVPREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048C-AC	5.1.01	N/A	No	Yes	Yes

Table 1. UC APL Product Summary (continued)

Component (See note.)	Release	Sub-Component	Certification Applicability		
			Core	Distribution	Access
Brocade NetIron NI-CER-2048C-ADVPREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048C-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048C-ADVPREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048F-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048F-ADVPREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048F-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048F-ADVPREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048CX-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048CX-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048CX-ADVPREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048FX-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048FX-ADVPREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048FX-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048FX-ADVPREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2024-2X10G	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2024-ADVU	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048-ADVU	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2024-ADVU-SW	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048-ADVU-SW	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024C-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024C-MEPREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024C-L3PREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024C-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024C-MEPREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024C-L3PREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024F-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024F-MEPREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024F-L3PREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024F-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024F-MEPREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024F-L3PREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024-2x10G	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024-MEU-SW	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024-L3U-SW	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048-MEU-SW	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048-L3U-SW	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048C-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048C-MEPREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048C-L3PREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048C-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048C-MEPREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048C-L3PREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048F-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048F-MEPREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048F-L3PREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048F-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048F-MEPREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048F-L3PREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048CX-AC	5.1.01	N/A	No	Yes	Yes

Table 1. UC APL Product Summary (continued)

Component (See note.)	Release	Sub-Component	Certification Applicability		
			Core	Distribution	Access
Brocade NetIron NI-CES-2048CX-MEPREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048CX-L3PREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048CX-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048CX-MEPREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048CX-L3PREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048FX-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048FX-MEPREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048FX-L3PREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048FX-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048FX-MEPREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048FX-L3PREM-DC	5.1.01	N/A	No	Yes	Yes

NOTE: The JITC tested the Brocade NetIron NI-CER-2048CX-ADVPREM-AC. JITC is certifying the other listed components because they employ the same software and similar hardware as the SUT.

LEGEND:
APL   Approved Products List   UC   Unified Capabilities
JITC   Joint Interoperability Test Command

The SUT is certified to support Assured Services within an ASLAN. If a component meets the minimum requirements for deployment in an ASLAN, it also meets the lesser requirements for deployment in a non-ASLAN. Non-ASLANs are "commercial grade" and provide support to Command and Control (C2) (ROUTINE only calls) (C2(R)) or non-C2 voice subscribers. When deployed in a non-ASLAN, the SUT may also be used to receive all levels of precedence, but is limited to supporting calls that are originated at ROUTINE precedence only. Non-ASLANs do not meet the availability or redundancy requirements for C2 or Special C2 users and therefore are not authorized to support precedence calls originated above ROUTINE.

Testing of the SUT did not include video services or data applications; however, simulated preferred data, best effort data, voice, and video traffic was generated during testing to determine the SUT's ability to prioritize and properly queue voice media and signaling traffic. No other configurations, features, or functions, except those cited within this document, are certified by the JITC. This certification expires upon changes that could affect interoperability, but no later than three years from the date the Field Security Office (FSO) provided a positive Certification and Accreditation (CA) Recommendation.

3. This finding is based on interoperability testing conducted by JITC, review of the vendor's Letters of Compliance (LoC), and FSO CA Recommendation. Interoperability testing was conducted by JITC, Fort Huachuca, Arizona, from 3 January through 4 March 2011. Review of the vendor's LoC was completed on 19 March 2011. The FSO provided a positive CA Recommendation on 4 April 2011 based on the security testing completed by DISA-led IA test teams and published in a separate report, Reference (g). Enclosure 2 documents the test results and describes the tested network and system configurations.

4. The interface, Capability Requirements (CR) and Functional Requirements (FR), and
component status of the SUT is listed in Tables 2 and 3. The threshold Capability/Functional
requirements for ASLAN components are established by Section 5.3.a of Reference (c) and were
used to evaluate the interoperability of the SUT.

Table 2. SUT Interface Interoperability Status

Interface	Applicability		UCR 2008, Change 2 Reference	Threshold CR/FR Requirements (See note 1.)	Status	Remarks
	D	A				
10Base-X	C	C²	5.3.1.3.1	1-6	Not Tested	See note 3.
100Base-X	R	C²	5.3.1.3.1	1-6	Met	
1000Base-X	R	C²	5.3.1.3.1	1-6	Met	
10000Base-X	C	C	5.3.1.3.1	1-6	Met	
802.11a	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Tested	See note 3.
802.11b	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Tested	See note 3.
802.11g	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Tested	See note 3.
802.11n	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Tested	See note 3.
802.16	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Tested	See note 3.

NOTES:
1. The SUT high-level CR and FR ID numbers depicted in the Threshold CRs/FRs column can be cross-referenced in Table 2. These high-level CR/FR requirements refer to a detailed list of requirements provided in Enclosure 3.
2. Distribution products must minimally support 100Base-X (802.3u) and 1000Base-X (802.3z). Access products must minimally support one of the following standards: 823.3i (10BaseT), 820.3j (10BaseF), 802.3u (100BaseTX/FX), 802.3z (1000BaseX), or 802.3ab (1000BaseT). Other rates and standards may be provided as conditional interfaces.
3. The SUT does not support this interface. This interface is not required for a distribution or access switch.

LEGEND:

A	Access	FR	Functional Requirement
C	Conditional	ID	Identification
CR	Capability Requirement	SUT	System Under Test
D	Distribution	UCR	Unified Capabilities Requirements

Table 3. SUT Capability Requirements and Functional Requirements Status

CR/FR ID	Capability/ Function	Applicability (See note 1.)	UCR Reference	Status	Remarks
	General Performance Parameters				
1	Performance Parameters	Required	5.3.1.3	Met	
	Port Interface Rates	Required	5.3.1.3.1	Met	
	Port Parameter Requirements	Required	5.3.1.3.2	Met	
	Class of Service Markings	Required	5.3.1.3.3	Met	
	VLAN Capabilities	Required	5.3.1.3.4	Met	
	Protocols	Required	5.3.1.3.5	Met	
	QoS Features	Required	5.3.1.3.6	Met	
	Network Monitoring	Required	5.3.1.3.7	Met	
	Security	Required	5.3.1.3.8	Met	See note 2.
	E2E Performance Requirements				
2	Voice Services	Required	5.3.1.4.1	Met	
	Video services	Required	5.3.1.4.2	Met	
	Data services	Required	5.3.1.4.3	Met	

Table 3. SUT Capability Requirements and Functional Requirements Status (continued)

CR/FR ID	Capability/ Function	Applicability (See note 1.)	UCR Reference	Status	Remarks
3	**NM Requirements**				
	Configuration Control	Required	5.3.1.6.1	Met	
	Operational Changes	Required	5.3.1.6.2	Met	
	Performance Monitoring	Required	5.3.1.6.3	Met	
	Alarms	Required	5.3.1.6.4	Met	
	Reporting	Required	5.3.1.6.5	Met	
4	**Engineering Requirements**				
	Physical Media	Required	5.3.1.7.1	Site requirement	
	Traffic Engineering	Required	5.3.1.7.3	Site requirement	Configured with four queues, each set to 25% of total bandwidth.
	Availability	Required	5.3.1.7.6	Partially driven by topology	100% availability during test.
	Redundancy	Required	5.3.1.7.7	Met	
5	**MPLS**				
	MPLS Requirements	Conditional	5.3.1.8.4.1	Not Tested	See note 3.
	MPLS VPN Augmentation to VLANs	Conditional	5.3.1.8.4.2	Not Tested	See note 3.
6	**IPv6 Requirements**				
	Product Requirements	Required	5.3.5.4	Met	

NOTES:
1. The annotation of 'required' refers to a high-level requirement category. The applicability of each sub-requirement is provided in Enclosure 3. The system under test does not need to provide conditional requirements. However, if a capability is provided, it must function according to the specified requirements.
2. Refers to IA requirements for UCR 2008, Change 2, Section 5.4. Detailed IA requirements are included in Reference (f).
3. MPLS is conditional for a distribution or access switch.

LEGEND:

CR	Capability Requirement	NM	Network Management
E2E	End-to-End	QoS	Quality of Service
FR	Functional Requirement	SUT	System Under Test
IA	Information Assurance	UCR	Unified Capabilities Requirements
ID	Identification	VLAN	Virtual Local Area Network
IPv6	Internet Protocol version 6	VPN	Virtual Private Network
MPLS	Multiprotocol Label Switching		

5. No detailed test report was developed in accordance with the Program Manager's request. JITC distributes interoperability information via the JITC Electronic Report Distribution (ERD) system, which uses Unclassified-But-Sensitive Internet Protocol Router Network (NIPRNet) e-mail. More comprehensive interoperability status information is available via the JITC System Tracking Program (STP). The STP is accessible by .mil/gov users on the NIPRNet at https://stp.fhu.disa.mil. Test reports, lessons learned, and related testing documents and references are on the JITC Joint Interoperability Tool (JIT) at https://jit.fhu.disa.mil (NIPRNet). Information related to DSN testing is on the Telecom Switched Services Interoperability (TSSI) website at http://jitc.fhu.disa.mil/tssi. All associated data is available on the Defense Information Systems Agency Unified Capability Coordination Office (UCCO) website located at http://www.disa.mil/ucco/.

JITC Memo, JTE, Special Interoperability Test Certification of the Brocade NetIron Carrier Ethernet Router (CER)/Carrier Ethernet Switch (CES) Series Release 5.1.01

6. The JITC point of contact is Mr. Edward Mellon, DSN 879-5159, commercial (520) 538-5159, FAX DSN 879-4347, or e-mail to Edward.Mellon@disa.mil. The JITC's mailing address is P.O. Box 12798, Fort Huachuca, AZ 85670-2798. The Tracking Number for the SUT is 1030602.

FOR THE COMMANDER:

3 Enclosures a/s   for BRADLEY A. CLARK
                                                   Chief
                                                   Battlespace Communications Portfolio

Distribution (electronic mail):
Joint Staff J-6
Joint Interoperability Test Command, Liaison, TE3/JT1
Office of Chief of Naval Operations, CNO N6F2
Headquarters U.S. Air Force, Office of Warfighting Integration & CIO, AF/XCIN (A6N)
Department of the Army, Office of the Secretary of the Army, DA-OSA CIO/G-6 ASA (ALT),
  SAIS-IOQ
U.S. Marine Corps MARCORSYSCOM, SIAT, MJI Division I
DOT&E, Net-Centric Systems and Naval Warfare
U.S. Coast Guard, CG-64
Defense Intelligence Agency
National Security Agency, DT
Defense Information Systems Agency, TEMC
Office of Assistant Secretary of Defense (NII)/DoD CIO
U.S. Joint Forces Command, Net-Centric Integration, Communication, and Capabilities
  Division, J68

ADDITIONAL REFERENCES

(c) Office of the Assistant Secretary of Defense, "Department of Defense Unified Capabilities Requirements 2008, Change 1," 22 January 2010

(d) Department of Defense Instruction 8100.03, "Department of Defense (DoD) Voice Networks," 16 January 2004

(e) Joint Interoperability Test Command, "ASLAN Component Test Plan (UCTP)," November 2010

(f) Joint Interoperability Test Command, "Information Assurance Test Plan (IATP)," 22 January 2009 with Change 1

(g) Joint Interoperability Test Command, "Information Assurance (IA) Assessment of Brocade Customer Edge Router Release (Rel.) 5.1.01 (Tracking Number 1030602)," 4 April 2011

(This page left intentionally blank).

CERTIFICATION TESTING SUMMARY

1. SYSTEM TITLE. The Brocade NetIron Carrier Ethernet Router (CER)/Carrier Ethernet Switch (CES) Series Release 5.1.01; hereinafter referred to as the system under test (SUT).

2. SPONSOR. Headquarters United States Army Information Systems Engineering Command (HQUSAISEC).

3. SYSTEM POC. Mr. Jordan Silk, ELIE-ISE-TI, Building 53302, Fort Huachuca, Arizona, 85613-5300, e-mail: jordan.silk@us.army.mil.

4. TESTER. Joint Interoperability Test Command (JITC), Fort Huachuca, Arizona.

5. SYSTEM DESCRIPTION. The SUT is used to transport voice signaling and media as part of an overall Voice over Internet Protocol (VoIP) system. The SUT provides availability, security, and Quality of Service (QoS) to meet the operational requirements of the network and Assured Services for the warfighter. The SUT is certified as a Distribution and Access Layer switch and is interoperable for joint use with other Assured Services Local Area Network (ASLAN) components listed on the Unified Capabilities (UC) Approved Products List (APL) with the following interfaces: 10000Base SX/LX and 100/1000BaseFX. The Brocade NetIron CER/CES Series, listed in Table 2-1, employ the same software and similar hardware as the SUT. The JITC analysis determined these systems to be functionally identical to the SUT for interoperability certification purposes. The SUT was tested with single processor and switch fabric. The SUT used redundant power supplies.

Table 2-1. UC APL Product Summary

Component (See note.)	Release	Sub-Component	Certification Applicability		
			Core	Distribution	Access
Brocade NetIron NI-CER-2048CX-ADVPREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2024C-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2024C-ADVPREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2024C-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2024C-ADVPREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2024F-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2024F-ADVPREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2024F-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2024F-ADVPREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048C-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048C-ADVPREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048C-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048C-ADVPREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048F-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048F-ADVPREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048F-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048F-ADVPREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048CX-AC	5.1.01	N/A	No	Yes	Yes

Table 2-1. UC APL Product Summary (continued)

Component (See note.)	Release	Sub-Component	Core	Distribution	Access
			Certification Applicability		
Brocade NetIron NI-CER-2048CX-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048CX-ADVPREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048FX-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048FX-ADVPREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048FX-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048FX-ADVPREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2024-2X10G	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2024-ADVU	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048-ADVU	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2024-ADVU-SW	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CER-2048-ADVU-SW	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024C-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024C-MEPREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024C-L3PREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024C-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024C-MEPREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024C-L3PREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024F-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024F-MEPREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024F-L3PREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024F-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024F-MEPREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024F-L3PREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024-2x10G	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024-MEU-SW	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2024-L3U-SW	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048-MEU-SW	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048-L3U-SW	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048C-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048C-MEPREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048C-L3PREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048C-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048C-MEPREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048C-L3PREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048F-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048F-MEPREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048F-L3PREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048F-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048F-MEPREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048F-L3PREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048CX-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048CX-MEPREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048CX-L3PREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048CX-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048CX-MEPREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048CX-L3PREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048FX-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048FX-MEPREM-AC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048FX-L3PREM-AC	5.1.01	N/A	No	Yes	Yes

Table 2-1. UC APL Product Summary (continued)

Component (See note.)	Release	Sub-Component	Certification Applicability		
			Core	Distribution	Access
Brocade NetIron NI-CES-2048FX-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048FX-MEPREM-DC	5.1.01	N/A	No	Yes	Yes
Brocade NetIron NI-CES-2048FX-L3PREM-DC	5.1.01	N/A	No	Yes	Yes

NOTE: The JITC tested the Brocade NetIron NI-CER-2048CX-ADVPREM-AC. JITC is certifying the other listed components because they employ the same software and similar hardware as the SUT.

LEGEND:
APL	Approved Products List		UC	Unified Capabilities
JITC	Joint Interoperability Test Command			

6. OPERATIONAL ARCHITECTURE. Figure 2-1 depicts a notional operational architecture that the SUT may be used in. The SUT is certified to support Assured Services within an ASLAN. If a component meets the minimum requirements for deployment in an ASLAN, it also meets the lesser requirements for deployment in a non-ASLAN. Non-ASLANs are "commercial grade" and provide support to Command and Control (C2) (ROUTINE only calls) (C2(R)) or non-C2 voice subscribers. When deployed in a non-ASLAN, the SUT may also be used to receive all levels of precedence, but is limited to supporting calls that are originated at ROUTINE precedence only. Non-ASLANs do not meet the availability or redundancy requirements for C2 or Special C2 users and therefore are not authorized to support precedence calls originated above ROUTINE.

Figure 2-1. Notional Architecture

LEGEND:

ASLAN	Assured Services Local Area Network
AS-SIP	Assured Services - Session Initiation Protocol
B/P/C/S	Base/Post/Camp/Station
BRI	Basic Rate Interface
CE	Customer Edge (CE Router)
DISN	Defense Information System Network
EBC	Edge Boundary Controller
EI	End Instrument
H.320	ITU-T standard for narrowband VTC
IP	Internet Protocol
ISDN	Integrated Services Digital Network
ITU-T	International Telecommunication Union - Telecommunication Standardization Sector
LSC	Local Session Controller
TDM	Time Division Multiplexing
VTC	Video Teleconferencing
WAN	Wide Area Network

7. INTEROPERABILITY REQUIREMENTS. The interface, Capability Requirements (CR) and Functional Requirements (FR), Information Assurance (IA), and other requirements for ASLAN infrastructure products are established by Section 5.3.1 of Reference (c).

7.1 Interfaces. The SUT uses the interfaces shown in Table 2-2 to connect to the Global Information Grid (GIG) network. This table shows the physical interfaces supported by the SUT and the associated standards.

Table 2-2. ASLAN Products Interface Requirements

Interface	UCR Ref	Criteria (See note 1.)	Applicability		Remarks
			D	A	
10Base-X	5.3.1.3.1	802.3i interface requirements and CRs/FRs 1-6	C	C[2]	Not Tested.[3]
100Base-X	5.3.1.3.1	802.3u interface requirements and CRs/FRs 1-6	R	C[2]	Met
1000Base-X	5.3.1.3.1	802.3z interface requirements and CRs/FRs 1-6	R	C[2]	Met
10000Base-X	5.3.1.3.1	802.3z interface requirements and CRs/FRs 1-6	R	C	Met
802.11a	5.3.1.3.1 and 5.3.1.7.2	802.11a wireless interface requirements and CRs/FRs 1-6	C	C	Not Tested.[3]
802.11b	5.3.1.3.1 and 5.3.1.7.2	802.11b wireless interface requirements and CRs/FRs 1-6	C	C	Not Tested.[3]
802.11g	5.3.1.3.1 and 5.3.1.7.2	802.11g wireless interface requirements and CRs/FRs 1-6	C	C	Not Tested.[3]
802.11n	5.3.1.3.1 and 5.3.1.7.2	802.11n wireless interface requirements and CRs/FRs 1-6	C	C	Not Tested.[3]
802.16	5.3.1.3.1 and 5.3.1.7.2	802.16 wireless interface requirements and CRs/FRs 1-6	C	C	Not Tested.[3]

NOTES:
1. The SUT high-level CR and FR ID numbers depicted in the Threshold CRs/FRs column can be cross-referenced in Table 2-3. These high-level CR/FR requirements refer to a detailed list of requirements provided in Enclosure 3.
2. Distribution products must minimally support 100Base-X (802.3u) and 1000Base-X (802.3z). Access products must minimally support one of the following standards: 823.3i (10BaseT), 820.3j (10BaseF), 802.3u (100BaseTX/FX), 802.3z (1000BaseX), or 802.3ab (1000BaseT). Other rates and standards may be provided as conditional interfaces.
3. The SUT does not support this interface. This interface is not required for a distribution or access switch.

LEGEND:

A	Access	FR	Functional Requirement
ASLAN	Assured Services Local Area Network	ID	Identification
CR	Capability Requirement	SUT	System Under Test
D	Distribution	UCR	Unified Capabilities Requirements

7.2 Capability Requirements (CR) and Functional Requirements (FR). Switches have required and conditional features and capabilities that are established by Section 5.3.1 of the UCR. The SUT does not need to provide non-critical (conditional) requirements. If they are provided, they must function according to the specified requirements. The SUTs features and capabilities and its aggregated requirements in accordance with the ASLAN requirements are listed in Table 2-3. Detailed CR/FR requirements are provided in Table 3-1 of Enclosure 3.

Table 2-3. ASLAN Capability Requirements and Functional Requirements

CR/FR ID	Capability/ Function	Applicability (See note 1.)	UCR Reference	Remarks
1	**General Performance Parameters**			
	Performance Parameters	Required	5.3.1.3	
	Port Interface Rates	Required	5.3.1.3.1	
	Port Parameter Requirements	Required	5.3.1.3.2	
	Class of Service Markings	Required	5.3.1.3.3	
	VLAN Capabilities	Required	5.3.1.3.4	
	Protocols	Required	5.3.1.3.5	
	QoS Features	Required	5.3.1.3.6	
	Network Monitoring	Required	5.3.1.3.7	
	Security	Required	5.3.1.3.8	See note 2.
2	**E2E Performance Requirements**			
	Voice Services	Required	5.3.1.4.1	
	Video services	Required	5.3.1.4.2	
	Data services	Required	5.3.1.4.3	
3	**NM Requirements**			
	Configuration Control	Required	5.3.1.6.1	
	Operational Changes	Required	5.3.1.6.2	
	Performance Monitoring	Required	5.3.1.6.3	
	Alarms	Required	5.3.1.6.4	
	Reporting	Required	5.3.1.6.5	
4	**Engineering Requirements**			
	Physical Media	Required	5.3.1.7.1	Site requirement
	Traffic Engineering	Required	5.3.1.7.3	Site requirement
	Availability	Required	5.3.1.7.6	Partially driven by topology
	Redundancy	Required	5.3.1.7.7	
5	**MPLS**			
	MPLS Requirements	Conditional	5.3.1.8.4.1	
	MPLS VPN Augmentation to VLANs	Conditional	5.3.1.8.4.2	
6	**IPv6 Requirements**			
	Product Requirements	Required	5.3.5.4	

NOTES:
1. The annotation of 'required' refers to a high-level requirement category. The applicability of each sub-requirement is provided in Enclosure 3. The system under test does not need to provide conditional requirements. However, if a capability is provided, it must function according to the specified requirements.
2. Refers to IA requirements for UCR 2008, Change 2, Section 5.4. Detailed IA requirements are included in Reference (f).

LEGEND:

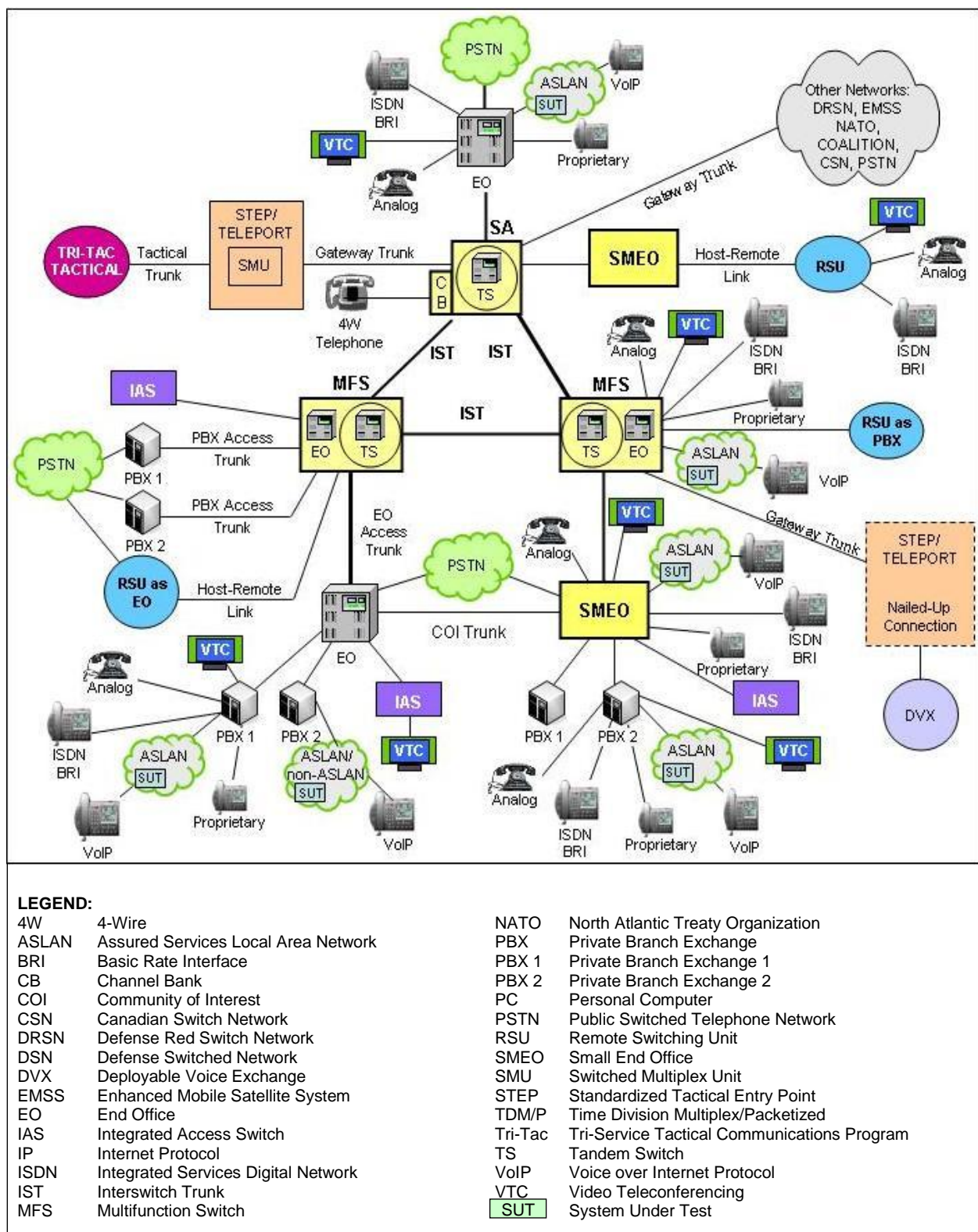|			
CR	Capability Requirement	NM	Network Management
E2E	End-to-End	QoS	Quality of Service
FR	Functional Requirement	SUT	System Under Test
IA	Information Assurance	UCR	Unified Capabilities Requirements
ID	Identification	VLAN	Virtual Local Area Network
IPv6	Internet Protocol version 6	VPN	Virtual Private Network
MPLS	Multiprotocol Label Switching		

7.3 Information Assurance. Table 2-4 details the IA requirements applicable to the ASLAN products.

Table 2-4. ASLAN Products IA Requirements

Requirement	Applicability (See note.)	UCR Reference	Criteria
General Requirements	Required	5.4.6.2	Detailed requirements and associated criteria for ASLAN products are listed in the IATP, Reference (f).
Authentication	Required	5.4.6.2.1	
Integrity	Required	5.4.6.2.2	
Confidentiality	Required	5.4.6.2.3	
Non-Repudiation	Required	5.4.6.2.4	
Availability	Required	5.4.6.2.5	

NOTE: The annotation of 'required' refers to a high-level requirement category. Refers to IA requirements for UCR Section 5.4. Detailed IA requirements are included in Reference (f).

LEGEND:
ASLAN   Assured Services Local Area Network   IATP   IA Test Plan
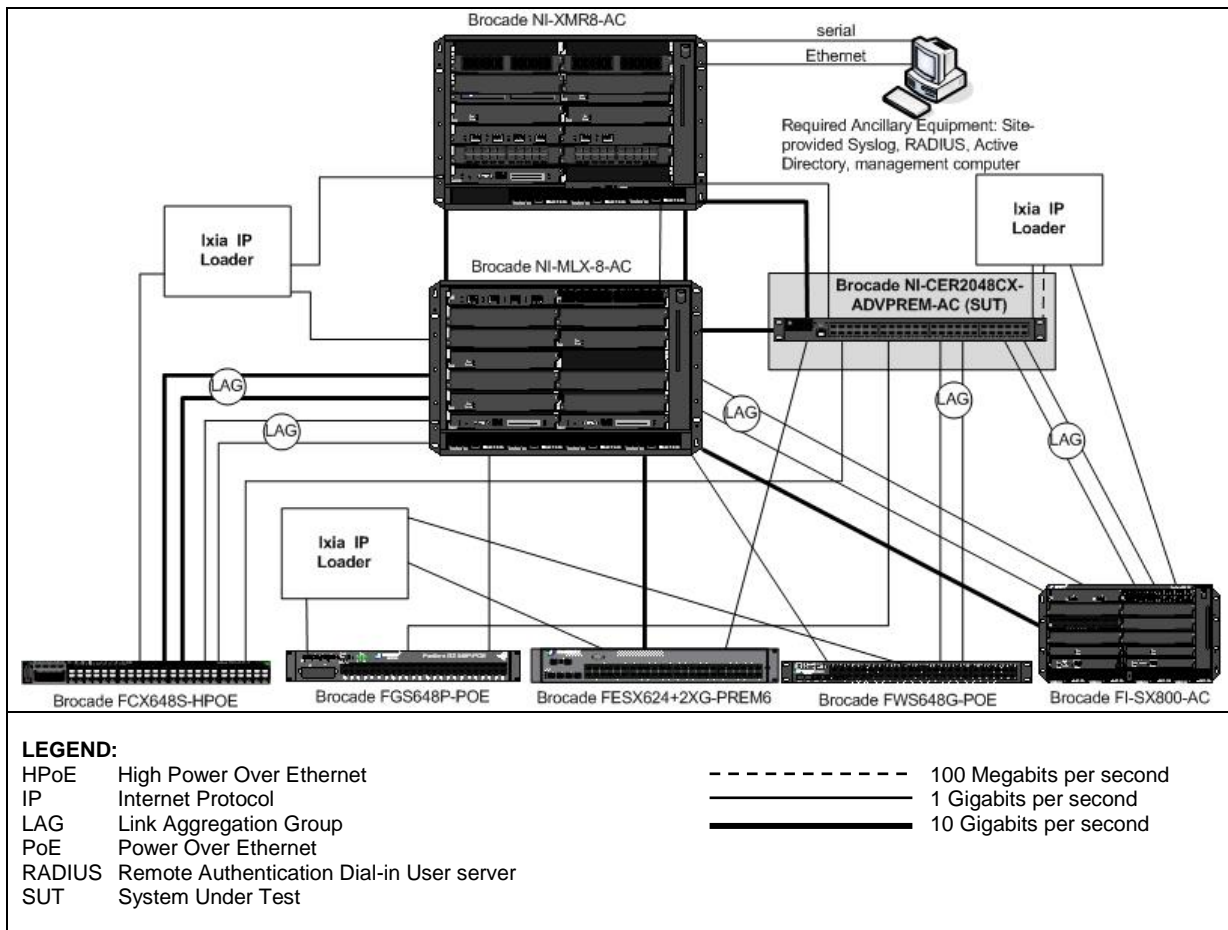IA   Information Assurance   UCR   Unified Capabilities Requirements

7.4 Other. None

8. TEST NETWORK DESCRIPTION. The SUT was tested at JITC in a manner and configuration similar to that of a notional operational environment. The Unified Capabilities Requirements (UCR) operational DSN Architecture is depicted in Figure 2-2, which depicts the relationship of the ASLAN and non-ASLAN to the DSN switch types. Testing the system's required functions and features was conducted using the test configurations depicted in Figure 2-3 through 2-5. Figure 2-3 depicts the ASLAN components in a homogeneous configuration. Figures 2-4 and 2-5 depict the ASLAN components in heterogeneous configuration with Cisco and Juniper ASLAN components.
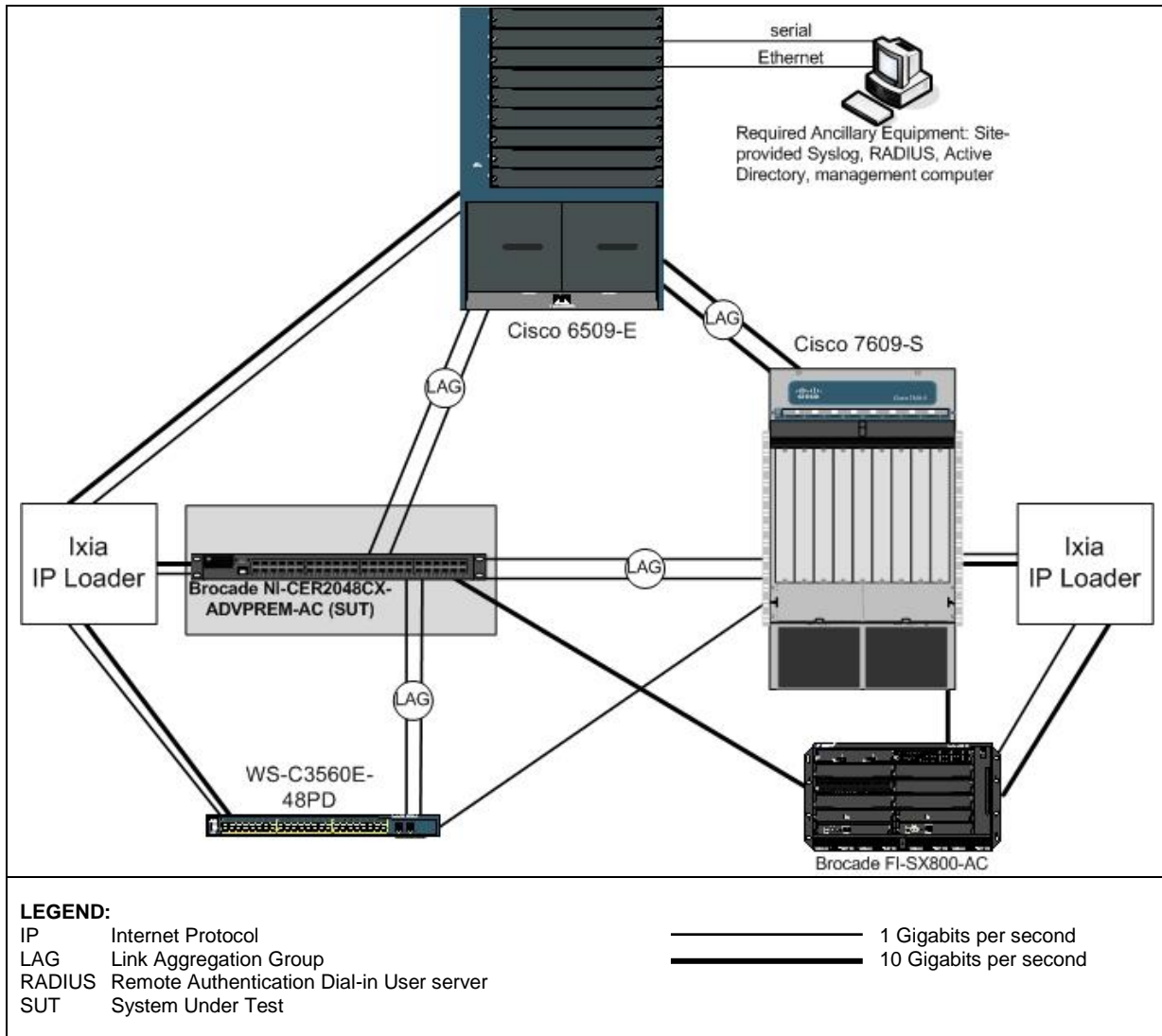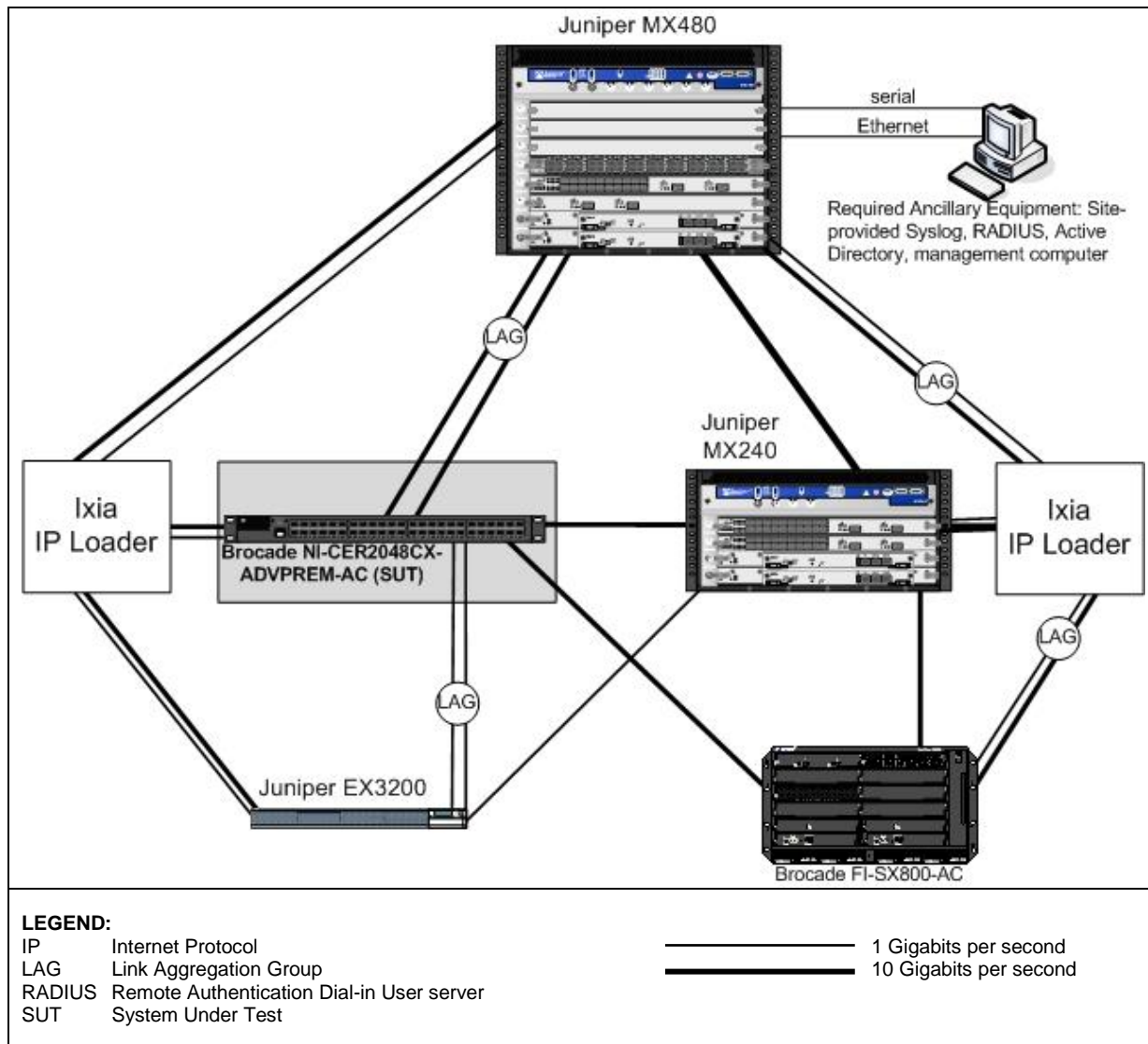
LEGEND:

4W	4-Wire	NATO	North Atlantic Treaty Organization
ASLAN	Assured Services Local Area Network	PBX	Private Branch Exchange
BRI	Basic Rate Interface	PBX 1	Private Branch Exchange 1
CB	Channel Bank	PBX 2	Private Branch Exchange 2
COI	Community of Interest	PC	Personal Computer
CSN	Canadian Switch Network	PSTN	Public Switched Telephone Network
DRSN	Defense Red Switch Network	RSU	Remote Switching Unit
DSN	Defense Switched Network	SMEO	Small End Office
DVX	Deployable Voice Exchange	SMU	Switched Multiplex Unit
EMSS	Enhanced Mobile Satellite System	STEP	Standardized Tactical Entry Point
EO	End Office	TDM/P	Time Division Multiplex/Packetized
IAS	Integrated Access Switch	Tri-Tac	Tri-Service Tactical Communications Program
IP	Internet Protocol	TS	Tandem Switch
ISDN	Integrated Services Digital Network	VoIP	Voice over Internet Protocol
IST	Interswitch Trunk	VTC	Video Teleconferencing
MFS	Multifunction Switch	SUT	System Under Test

Figure 2-2. DSN Architecture

2-8

Figure 2-3. SUT Homogeneous Test Configuration

serial

Ethernet

Required Ancillary Equipment: Site-provided Syslog, RADIUS, Active Directory, management computer

Cisco 6509-E

LAG

Cisco 7609-S

LAG

Ixia IP Loader

Brocade NI-CER2048CX-ADVPREM-AC (SUT)

LAG

Ixia IP Loader

LAG

WS-C3560E-48PD

Brocade FI-SX800-AC

LEGEND:
IP   Internet Protocol
LAG   Link Aggregation Group
RADIUS   Remote Authentication Dial-in User server
SUT   System Under Test

——————————— 1 Gigabits per second
━━━━━━━━━━━ 10 Gigabits per second

Figure 2-4. SUT Heterogeneous Test Configuration with Cisco

Figure 2-5. SUT Heterogeneous Test Configuration with Juniper

9. SYSTEM CONFIGURATIONS. Table 2-5 provides the system configurations and hardware and software components tested with the SUT. The SUT was tested in an operationally realistic environment to determine its interoperability capability with associated network devices and network traffic.

Table 2-5. Tested System Configurations

System Name	Equipment		
Required Ancillary Equipment (site-provided)	Active Directory		
	Public Key Infrastructure		
	RADIUS		
	SysLog Server		
Additional Equipment Needed	Site-provided Management Workstation		
Cisco ASLAN	**Cisco Hardware**	**Cisco Software**	
	WS-6509-E	IOS® 12.2(33)SX14	
	7609-S	IOS® 12.2(33)SRE2	
	WS-C3560E-48PD	IOS® 12.2(53)SE2	
Juniper ASLAN	**Juniper Hardware**	**Juniper Software**	
	MX480	9.3 R4.4	
	MX240	9.3 R4.4	
	EX3200	9.3 R2.8	
Brocade ASLAN	**Brocade Hardware**	**Brocade Software**	
	NI-XMR-8-AC	NI 5.1.01	
	NI-MLX-8-AC	NI 5.1.01	
	FI-SX800-AC	FI 7.2.01	
	FCX648S-HPOE	FI 7.2.01	
	FESX624+2XG-PREM6	FI 7.2.01	
	FGS648P-POE	FI 7.2.01	
	FWS648G-POE	FI 7.2.01	
System Under Test (See note.)	**Equipment**		
	Sub-components (See note.)		Software
Brocade NetIron NI-CER-2048CX-ADVPREM-AC, Brocade NetIron NI-CER-2048CX-ADVPREM-AC, Brocade NetIron NI-CER-2024C-AC, Brocade NetIron NI-CER-2024C-ADVPREM-AC, Brocade NetIron NI-CER-2024C-DC, Brocade NetIron NI-CER-2024C-ADVPREM-DC, Brocade NetIron NI-CER-2024F-AC, Brocade NetIron NI-CER-2024F-ADVPREM-AC, Brocade NetIron NI-CER-2024F-DC, Brocade NetIron NI-CER-2024F-ADVPREM-DC, Brocade NetIron NI-CER-2048C-AC, Brocade NetIron NI-CER-2048C-ADVPREM-AC, Brocade NetIron NI-CER-2048C-DC, Brocade NetIron NI-CER-2048C-ADVPREM-DC, Brocade NetIron NI-CER-2048F-AC, Brocade NetIron NI-CER-2048F-ADVPREM-AC, Brocade NetIron NI-CER-2048F-DC, Brocade NetIron NI-CER-2048F-ADVPREM-DC, Brocade NetIron NI-CER-2048CX-AC, Brocade NetIron NI-CER-2048CX-DC, Brocade NetIron NI-CER-2048CX-ADVPREM-DC, Brocade NetIron NI-CER-2048FX-AC, Brocade NetIron NI-CER-2048FX-ADVPREM-AC, Brocade NetIron NI-CER-2048FX-DC, Brocade NetIron NI-CER-2048FX-ADVPREM-DC, Brocade NetIron NI-CER-2024-2X10G, Brocade NetIron NI-CER-2024-ADVU, Brocade NetIron NI-CER-2048-ADVU, Brocade NetIron NI-CER-2024-ADVU-SW, Brocade NetIron NI-CER-2048-ADVU-SW, Brocade NetIron NI-CES-2024C-AC, Brocade NetIron NI-CES-2024C-MEPREM-AC, Brocade NetIron NI-CES-2024C-L3PREM-AC, Brocade NetIron NI-CES-2024C-DC, Brocade NetIron NI-CES-2024C-MEPREM-DC, Brocade NetIron NI-CES-2024C-L3PREM-DC, Brocade NetIron NI-CES-2024F-AC, Brocade NetIron NI-CES-2024F-MEPREM-AC, Brocade NetIron NI-CES-2024F-L3PREM-AC,	N/A		5.1.01

Table 2-5. Tested System Configurations (continued)

System Under Test (See note.)	Equipment	
	Sub-components (See note.)	Software
Brocade NetIron NI-CES-2024F-DC, Brocade NetIron NI-CES-2024F-MEPREM-DC, Brocade NetIron NI-CES-2024F-L3PREM-DC, Brocade NetIron NI-CES-2024-2x10G, Brocade NetIron NI-CES-2024-MEU-SW, Brocade NetIron NI-CES-2024-L3U-SW, Brocade NetIron NI-CES-2048-MEU-SW, Brocade NetIron NI-CES-2048-L3U-SW, Brocade NetIron NI-CES-2048C-AC, Brocade NetIron NI-CES-2048C-MEPREM-AC, Brocade NetIron NI-CES-2048C-L3PREM-AC, Brocade NetIron NI-CES-2048C-DC, Brocade NetIron NI-CES-2048C-MEPREM-DC, Brocade NetIron NI-CES-2048C-L3PREM-DC, Brocade NetIron NI-CES-2048F-AC, Brocade NetIron NI-CES-2048F-MEPREM-AC, Brocade NetIron NI-CES-2048F-L3PREM-AC, Brocade NetIron NI-CES-2048F-DC, Brocade NetIron NI-CES-2048F-MEPREM-DC, Brocade NetIron NI-CES-2048F-L3PREM-DC, Brocade NetIron NI-CES-2048CX-AC, Brocade NetIron NI-CES-2048CX-MEPREM-AC, Brocade NetIron NI-CES-2048CX-L3PREM-AC, Brocade NetIron NI-CES-2048CX-DC, Brocade NetIron NI-CES-2048CX-MEPREM-DC, Brocade NetIron NI-CES-2048CX-L3PREM-DC, Brocade NetIron NI-CES-2048FX-AC, Brocade NetIron NI-CES-2048FX-MEPREM-AC, Brocade NetIron NI-CES-2048FX-L3PREM-AC, Brocade NetIron NI-CES-2048FX-DC, Brocade NetIron NI-CES-2048FX-MEPREM-DC, Brocade NetIron NI-CES-2048FX-L3PREM-DC	N/A	5.1.01

NOTE: Components bolded and underlined were tested by JITC. The other components in the family series were not tested; however, they utilize the same software and hardware and JITC analysis determined them to be functionally identical for interoperability certification purposes and they are also certified for joint use.

LEGEND:
ASLAN	Assured Services Local Area Network	N/A	Not Applicable
HPOE	High Power over Ethernet	RADIUS	Remote Authentication Dial-In User Server

10. TESTING LIMITATIONS. None

11. INTEROPERABILITY EVALUATION RESULTS. The SUT meets the critical interoperability requirements for a Distribution and Access Layer switch in accordance with UCR 2008, Change 2, Section 5.3.1, and is certified for joint use with other network infrastructure products listed on the UC APL. Additional discussion regarding specific testing results is located in subsequent paragraphs.

11.1 Interfaces. The interface status of the SUT is provided in Table 2-6.

Table 2-6. SUT Interface Requirements Status

Interface	Applicability		UCR 2008, Change 2 Reference	Threshold CR/FR Requirements (See note 1.)	Status	Remarks
	D	A				
10Base-X	C	C[2]	5.3.1.3.1	1-6	Not Tested	See note 3.
100Base-X	R	C[2]	5.3.1.3.1	1-6	Met	
1000Base-X	R	C[2]	5.3.1.3.1	1-6	Met	
10000Base-X	C	C	5.3.1.3.1	1-6	Met	
802.11a	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Tested	See note 3.
802.11b	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Tested	See note 3.
802.11g	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Tested	See note 3.
802.11n	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Tested	See note 3.
802.16	C	C	5.3.1.3.1/5.3.1.7.2	1-6	Not Tested	See note 3.

NOTES:
1. The SUT high-level CR and FR ID numbers depicted in the Threshold CRs/FRs column can be cross-referenced in Table 2-3. These high-level CR/FR requirements refer to a detailed list of requirements provided in Enclosure 3.
2. Distribution products must minimally support 100Base-X (802.3u) and 1000Base-X (802.3z). Access products must minimally support one of the following standards: 823.3i (10BaseT), 820.3j (10BaseF), 802.3u (100BaseTX/FX), 802.3z (1000BaseX), or 802.3ab (1000BaseT). Other rates and standards may be provided as conditional interfaces.
3. The SUT does not support this interface. This interface is not required for a distribution or access switch.

LEGEND:

A	Access	FR	Functional Requirement
C	Conditional	ID	Identification
CR	Capability Requirement	SUT	System Under Test
D	Distribution	UCR	Unified Capabilities Requirements

11.2 Capability Requirements (CR) and Functional Requirements (FR). The SUT CR and FR status is depicted in Table 2-7. Detailed CR/FR requirements are provided in Enclosure 3, Table 3-1.

Table 2-7.   SUT Capability Requirements and Functional Requirements Status

CR/FR ID	Capability/ Function	Applicability (See note 1.)	UCR Reference	Status	Remarks
	General Performance Parameters				
1	Performance Parameters	Required	5.3.1.3	Met	
	Port Interface Rates	Required	5.3.1.3.1	Met	
	Port Parameter Requirements	Required	5.3.1.3.2	Met	
	Class of Service Markings	Required	5.3.1.3.3	Met	
	VLAN Capabilities	Required	5.3.1.3.4	Met	
	Protocols	Required	5.3.1.3.5	Met	
	QoS Features	Required	5.3.1.3.6	Met	
	Network Monitoring	Required	5.3.1.3.7	Met	
	Security	Required	5.3.1.3.8	Met	See note 2.
2	**E2E Performance Requirements**				
	Voice Services	Required	5.3.1.4.1	Met	
	Video services	Required	5.3.1.4.2	Met	
	Data services	Required	5.3.1.4.3	Met	

Table 2-7. SUT Capability Requirements and Functional Requirements Status (continued)

CR/FR ID	Capability/ Function	Applicability (See note 1.)	UCR Reference	Status	Remarks
3	**NM Requirements**				
	Configuration Control	Required	5.3.1.6.1	Met	
	Operational Changes	Required	5.3.1.6.2	Met	
	Performance Monitoring	Required	5.3.1.6.3	Met	
	Alarms	Required	5.3.1.6.4	Met	
	Reporting	Required	5.3.1.6.5	Met	
4	**Engineering Requirements**				
	Physical Media	Required	5.3.1.7.1	Site requirement	
	Traffic Engineering	Required	5.3.1.7.3	Site requirement	Configured with four queues, each set to 25% of total bandwidth.
	Availability	Required	5.3.1.7.6	Partially driven by topology	100% availability during test.
	Redundancy	Required	5.3.1.7.7	Met	
5	**MPLS**				
	MPLS Requirements	Conditional	5.3.1.8.4.1	Not Tested	See note 3.
	MPLS VPN Augmentation to VLANs	Conditional	5.3.1.8.4.2	Not Tested	See note 3.
6	**IPv6 Requirements**				
	Product Requirements	Required	5.3.5.4	Met	

NOTES:
1. The annotation of 'required' refers to a high-level requirement category. The applicability of each sub-requirement is provided in Enclosure 3. The system under test does not need to provide conditional requirements. However, if a capability is provided, it must function according to the specified requirements.
2. Refers to IA requirements for UCR 2008, Change 2, Section 5.4. Detailed IA requirements are included in Reference (f).
3. MPLS is conditional for a distribution or access switch.

LEGEND:
CR	Capability Requirement	NM	Network Management
E2E	End-to-End	QoS	Quality of Service
FR	Functional Requirement	SUT	System Under Test
IA	Information Assurance	UCR	Unified Capabilities Requirements
ID	Identification	VLAN	Virtual Local Area Network
IPv6	Internet Protocol version 6	VPN	Virtual Private Network
MPLS	Multiprotocol Label Switching		

a. General Performance Parameters

(1) Performance Parameters. The SUT operated in the required non-blocking mode on all interfaces. Jitter was measured to be less than one millisecond (ms), which, is the limits of the resolution of the test equipment. Latency was also measured to be less than one ms average. Packet loss was zero percent. All performance requirements were met by the SUT.

(2) Port Interface Rates. All interfaces linked up at the required rates. All interfaces negotiated for the correct rates. The SUT supports all of the required port rates and the optional 10 Gigabits per second (Gbps) rate.

(3) Port Parameter Requirements. Port parameters were configurable, and conformed to the requirements. The SUT was tested to confirm Auto-negotiation, Force Mode, Link Aggregation, Spanning Tree and IA confirmed 802.1 x authentications.

(4) Class of Service (CoS) Markings. Class of service was preserved throughout the SUT. The SUT was able to assign any Differentiated Services Code Point (DSCP) value 0-63 to all traffic. The SUT conformed to all required Request for Comments (RFCs). The vendor additionally submitted Letters of Compliance (LoC) for all required RFCs associated with CoS. The DSCP values were handled correctly by the queuing mechanism in the SUT.

(5) Virtual Local Area Network (VLAN) Capabilities. The VLAN markings were preserved on the SUT, VLAN tagged traffic was separated and managed according to Institute of Electrical and Electronics Engineers (IEEE) 802.1q. The SUT successfully performed both port-based and address-based VLANs.

(6) Protocols. The required protocols are defined in the Department of Defense Information Technology Standards Registry (DISR) profile. The following protocols operated as expected, and were fully interoperable with ASLAN components from Juniper and Cisco: Open Shortest Path First (OSPF), Link Aggregation Control Protocol (LACP), Simple Network Management Protocol (SNMP), Spanning Tree, etc. The required protocols were fully interoperable with ASLAN components from other vendors. The vendor submitted an LoC for all the profiles listed in the DISR.

(7) QoS Features. QoS, which includes rate-shaping, performed as configured. All variance was within the limitation of resolution of the test instruments. The ASLAN infrastructure components shall be capable of accepting any packet tagged with a DSCP value (0-63) on an ingress port and assign that packet to a QoS behavior listed in UCR 2008, Change 2, Section 5.3.1.3.6. The SUT prioritized the following traffic for queuing from lowest to highest with distinct Internet Protocol version 4 (IPv4) DSCP tags using an Ixia Internet Protocol (IP) loader: best effort data, preferred data, video media and signaling, and voice media and signaling. The traffic load included a data best effort load of 35 percent line rate, voice at 25 percent of line rate, 25 percent video and 25 percent preferred data. Voice signaling and voice media are in the highest priority queue, 25 percent of video media in the next lower priority queue, and 25 percent of preferred data in the lowest priority queue. Best effort data is a lower priority than preferred data. The test equipment recorded that the higher prioritized traffic was properly queued above lower prioritized best effort traffic. In addition, it was verified that the SUT can assign any DSCP value from 0-63 for each type of traffic, which met this requirement.

(8) Network Monitoring (NM). NM via SNMP was evaluated by the DISA-led IA team and published in a separate report, Reference (f).

(9) Security. Security testing is accomplished via DISA-led IA test teams and published in a separate report, Reference (f).

b. End-to-End Performance Requirements.

(1) Voice Services. End-to-End performance was evaluated across the Brocade ASLAN, as well as across a predominately Cisco and Juniper ASLAN with the SUT replacing the distribution element. Voice jitter, latency, and packet loss were measured below the allowable 5 ms requirement in all scenarios. Across the SUT, latency and jitter were measured at less than one ms and packet loss was zero.

(2) Video services. End-to-End performance was evaluated across the Brocade ASLAN, as well as across a predominately Cisco and Juniper ASLAN with the SUT replacing the distribution element. Video jitter, latency, and packet loss were measured below the allowable 5 ms requirement in all scenarios. Across the SUT, latency and jitter were measured at less than one ms and packet loss was zero.

(3) Data services. End-to-End performance was evaluated across the Brocade ASLAN, as well as across a predominately Cisco and Juniper ASLAN with the SUT replacing the distribution element. Data latency and packet loss were measured below the allowable 5 ms requirement in all scenarios. Across the SUT the average, latency and jitter were measured at less than one ms and packet loss was zero when total link traffic did not exceed 98 percent of the uplink capacity. The UCR 2008, Change 2 requires 50 percent non-blocking.

c. Network Management Requirements.

(1) Configuration Control. Network Management was evaluated by IA, and is available as a separate report, Reference (f). All of the network management and SNMP requirements are covered in the vendor LoC.

(2) Operational Changes. Network Management was evaluated by IA, and is available as a separate report, Reference (f). The SUT is configurable to report operational changes to a SysLog server.

(3) Performance Monitoring. Network Management was evaluated by IA, and is available as a separate report, Reference (f).

(4) Alarms. Network Management was evaluated by IA, and is available as a separate report, Reference (f).

(5) Reporting. Network Management was evaluated by IA, and is available as a separate report, Reference (f).

d. Engineering Requirements. System reliability must be engineered for 99.999 percent for FLASH/FLASH OVERRIDE users, 99.997 for IMMEDIATE/PRIORITY users in an ASLAN. ROUTINE users may be supported by a non-ASLAN with a reliability of only 99.9 percent. C2 users may not be supported by a non-ASLAN. It is the site responsibility to configure the SUT in a manner which meets the user requirement and that does not create a single point of failure which could impact more than 96 C2 users.

The SUT must meet the redundancy requirement with either a single chassis or multiple chassis. The requirement states no single point of failure may take longer than five seconds for the network to resume IP traffic. The SUT has a single Central Processing Unit (CPU), Switch Fabric, and redundant power supply resources. Therefore, it is certified for use in a redundant chassis configuration, where the SUT fails over to another chassis in the case of catastrophic failure. The SUT performed power supply failover with no loss. Device failover was performed with the measured loss lasting less than one ms for IPv4 and Internet Protocol version 6 (IPv6) traffic. Device failover was performed in less than five seconds for IPv4 traffic when configured across a homogeneous network and when configured as an element either in a Juniper and Cisco network.

e. Multiprotocol Label Switching (MPLS) Requirements. MPLS was not evaluated. This is a conditional requirement for a distribution or access switch.

f. IPv6 Requirements. All IPv6 requirements were met by testing and/or LoC. The SUT was tested with IPv6 voice, video, and data traffic.

11.3 Information Assurance. Security testing is accomplished via DISA-led Information Assurance test teams and published in a separate report, Reference (f).

11.4 Other. None

12. TEST AND ANALYSIS REPORT. No detailed test report was developed in accordance with the Program Manager's request. JITC distributes interoperability information via the JITC Electronic Report Distribution (ERD) system, which uses Unclassified-But-Sensitive Internet Protocol Router Network (NIPRNet) e-mail. More comprehensive interoperability status information is available via the JITC System 2-7 Tracking Program (STP). The STP is accessible by .mil/gov users on the NIPRNet at https://stp.fhu.disa.mil. Test reports, lessons learned, and related testing documents and references are on the JITC Joint Interoperability Tool (JIT) at http://jit.fhu.disa.mil (NIPRNet). Information related to DSN testing is on the Telecom Switched Services Interoperability (TSSI) website at http://jitc.fhu.disa.mil/tssi.

SYSTEM FUNCTIONAL AND CAPABILITY REQUIREMENTS

The Assured Services Local Area Networks (ASLAN) components have required and conditional features and capabilities that are established by Section 5.3.1 of the Unified Capabilities Requirements (UCR). The system under test does not need to provide conditional requirements. However, if a capability is provided, it must function according to the specified requirements. The detailed Functional requirements (FR) and Capability Requirements for ASLAN products are listed in Table 3-1. Detailed Information Assurance (IA) requirements are included in Reference (f).

Table 3-1. ASLAN Products Capability/Functional Requirements

ID	Requirement (See note.)		UCR Reference
1	ASLAN components can have no single point of failure for >96 users for C2 and Special C2 users. Non-ASLAN components can have a single point of failure for C2(R) and non-C2 users. (R)		5.3.1.2.1, 5.3.1.7.7
2	Non-blocking of any voice or video traffic at 50% for core and distribution layer switches and 12.5% blocking for access layer switches. (R)		5.3.1.3
3	Maximum of 1 ms of jitter for voice and 10 ms for video for all ASLAN components. (R) Does not apply to preferred data and best effort data.		5.3.1.3
4	Maximum of .015% packet loss for voice and .05 % for video and preferred data for all ASLAN components. (R) Does not apply to best effort data.		5.3.1.3
5	Maximum of 2 ms latency for voice, 10 ms for video, and 15 ms for preferred data for all ASLAN components. (R) Does not apply to best effort data.		5.3.1.3
6	100 Mbps IAW IEEE 802.3u and 1 Gbps IAW IEEE 802.3z for core and distribution layer components and at least one of the following IEEE interfaces for access layer components: 802.3i, 802.3j, 802.3u, 802.3ab, and 802.3z. (R)		5.3.1.3.1
7	Force mode and auto-negotiation IAW IEEE 802.3, filtering IAW RFC 1812, and flow control IAW IEEE 802.3x. (R)		5.3.1.3.2
8	Port Parameter Requirements	Auto-negotiation IAW IEEE 802.3. (R)	5.3.1.3.2
9		Force mode IAW IEEE 802.3. (R)	
10		Flow control IAW IEEE 802.3x. (R) Conditional for Core	
11		Filtering IAW RFC 1812. (R)	
12		Link Aggregation IAW IEEE 802.3ad (output/egress ports only). (R)	
13		Spanning Tree Protocol IAW IEEE 802.1D. (R) Conditional for Core	
14		Multiple Spanning Tree IAW IEEE 802.1s. (R) Conditional for Core	
15		Rapid Reconfiguration of Spanning Tree IAW IEEE 802.1w. (R) Conditional for Core	
16	LACP link Failover and Link Aggregation IAW IEEE 802.3ad (uplink ports only) core and distribution switches (C)		5.3.1.3.2, 5.3.1.7.7.1
17	Class of Service Marking: Layer 3 DSCPs IAW RFC 2474. (R) Layer 2 3-bit user priority field of the IEEE 802.1Q 2-byte TCI field. (C)		5.3.1.3.3
18	VLAN Capabilities IAW IEEE 802.1Q. (R)		5.3.1.3.4
19	Protocols IAW DISR profile (IPv4 and IPv6). IPv4 (R: LAN Switch, Layer 2 Switch): IPv6 (R: LAN Switch, C: Layer 2 Switch). Note: Layer 2 switch is required to support only RFC 2460, 5095, 2464, and be able to queue packets based on DSCPs in accordance with RFC 2474.		5.3.1.3.5
20	QoS Features	Shall support minimum of 4 queues. (R)	5.3.1.3.6
21		Must be able to assign VLAN tagged packets to a queue. (R)	
22		Support DSCP PHBs per RFCs 2474, 2597, 2598, and 3246. (R: LAN Switch). Note: Layer 2 switch is required to support RFC 2474 only.	
23		Support a minimum of one of the following: Weighted Fair Queuing (WFQ) IAW RFC 3662, Priority Queuing (PQ) IAW RFC 1046, or Class-Based WFQ IAW RFC 3366. (R)	
24		Must be able to assign a bandwidth or percent of traffic to any queue. (R)	
25	Network Monitoring	SNMP IAW RFC's 1157, 2206, 3410, 3411, 3412, 3413, and 3414. (R)	5.3.1.3.7
26		SNMP traps IAW RFC1215. (R)	
27		Remote monitoring IAW RFC1281 and Advanced Encryption Standard (AES) Cipher Algorithm in the SNMP User-based Security Model IAW RFC 3826. (R)	
28	Product Requirements Summary IAW UCR 2008, Change 2, Table 5.3.1-5. (R)		5.3.1.3.9
29	E2E Performance (Voice)	No more than 6 ms latency over any 5-minute period measured under 100% congestion. (R)	5.3.1.4.1
		No more than 3 ms jitter over any 5-minute period measured under 100% congestion. (R)	
		Packet loss not to exceed .045% engineered (queuing) parameters over any 5-minute period under 100% congestion. (R)	

Table 3-1. SUT Capability and Functional Requirements (continued)

ID			Requirement (See note.)	UCR Reference
30	E2E Performance (Video)		No more than 30 ms latency over any 5-minute period measured under 100% congestion. (R)	5.3.1.4.2
			No more than 30 ms jitter over any 5-minute period measured under 100% congestion. (R)	
			Packet loss not to exceed .15% engineered (queuing) parameters over any 5-minute period under 100% congestion. (R)	
31	E2E Performance (Data)		No more than 45 ms latency over any 5-minute period measured under 100% congestion. (R)	5.3.1.4.3
			Packet loss not to exceed .15% engineered (queuing) parameters over any 5-minute period under 100% congestion. (R)	
32	LAN Network Management		Configuration Control for ASLAN and non-ASLAN. (R)	5.3.1.6.1
33			Operational Controls for ASLAN and non-ASLAN. (R)	5.3.1.6.2
34			Performance Monitoring for ASLAN and non-ASLAN. (R)	5.3.1.6.3
35			Alarms for ASLAN and non-ASLAN. (R)	5.3.1.6.4
36			Reporting for ASLAN and non-ASLAN. (R)	5.3.1.6.5
37	Redundancy		Redundant Power Supplies. (Required on standalone redundant products.)	5.3.1.7.7
38			Chassis Failover. (Required on standalone redundant products.)	
39			Switch Fabric Failover. (Required on standalone redundant products.)	
40			Non-LACP Link Failover. (R)	
41			Fiber Blade Failover. (R)	
42			Stack Failover. (C) (Required if the stack supports more than 96 users.)	
43			CPU (routing engine) blade Failover. (R)	
44	MPLS		MPLS May not add measurable Loss or Jitter to system. (C)	5.3.1.8.4.1
45			MPLS Conforms to RFCs in Table 5.3.1-14. (C)	5.3.1.8.4.1
46			MPLS Support L2 and L3 VPNs. (C)	5.3.1.8.4.2.1 /2
47	IPv6 Product Requirements: Dual Stack for IPv4 and IPv6 IAW RFC 4213 if routing functions are supported. (C)			5.3.5.4
48	IPv6 System Requirements		Support IPv6 IAW RFCs 2460 and 5095 if routing functions are supported. (C)	5.3.5.4
49			Support IPv6 packets over Ethernet IAW RFC2464. (R)	5.3.5.4
50			Support MTU discovery IAW RFC 1981 if routing functions are supported. (R)	5.3.5.4.1
51			Support a minimum MTU of 1280 IAW RFCs 2460 and 5095. (C)	5.3.5.4.1
52			Shall support IPv6 addresses IAW RFC 4291. (R)	5.3.5.4.3
53			Shall support IPv6 scoped addresses IAW RFC4007. (R)	5.3.5.4.3
54			if routing functions are supported: If DHCP is supported must be IAW RFC3315, if DHCPv6 is supported it shall be IAW RFC 3313. (C)	5.3.5.4.4
55	IPv6 Router Advertise-ments		If the system supports routing functions, the system shall inspect valid router advertisements sent by other routers and verify that the routers are advertising consistent information on a link and shall log any inconsistent router advertisements, and shall prefer routers that are reachable over routers whose reachability is suspect or unknown. (C)	5.3.5.4.5.2
56			If the system supports routing functions, the system shall include the MTU value in the router advertisement message for all links in accordance with RFCs 2461 and 4861. (C)	
57			IPv6 Neighbor Discovery: The system shall not set the override flag bit in the neighbor advertisement message for solicited advertisements for anycast addresses or solicited proxy advertisements. (R)	
58	IPv6 Neighbor Discovery		if routing functions are supported: Neighbor discovery IAW RFCs 2461 and 4861. (C)	5.3.5.4.5
59			The system shall not set the override flag bit in the neighbor advertisement message for solicited advertisements for anycast addresses or solicited proxy advertisements. (R)	
60			The system shall set the override flag bit in the neighbor advertisement message to "1" if the message is not an anycast address or a unicast address for which the system is providing proxy service. (R)	
61	IPv6 SLAAC and Manual Address Assignment		If the system supports stateless IP address Auto-configuration, the system shall support IPv6 SLAAC for interfaces supporting UC functions in accordance with RFCs 2462 and 4862. (C)	5.3.5.4.6
62			If the product supports IPv6 SLAAC, the product shall have a configurable parameter that allows the function to be enabled and disabled. (C)	
63			If the product supports IPv6 SLAAC, the product shall have a configurable parameter that allows the "managed address configuration" flag and the "other stateful configuration" flag to always be set and not perform stateless auto-configuration. (C)	
64			If the product supports stateless IP address auto-configuration including those provided for the commercial market, the DAD shall be disabled in accordance with RFCs 2462 and 4862. (R)	
65			The system shall support manual assignment of IPv6 addresses. (R)	
66			If the system provides routing functions, the system shall default to using the "managed address configuration" flag and the "other stateful flag" set to TRUE in their router advertisements when stateful auto-configuration is implemented. (C)	

Table 3-1. SUT Capability and Functional Requirements (continued)

ID		Requirement (See note.)	UCR Reference
67		The system shall support the ICMPv6 as described in RFC 4443. (R)	
68		The system shall have a configurable rate limiting parameter for rate limiting the forwarding of ICMP messages. (R)	
69	IPv6 ICMP	The system shall support the capability to enable or disable the ability of the system to generate a Destination Unreachable message in response to a packet that cannot be delivered to its destination for reasons other than congestion. (R) Required if LS supports routing functions.	5.3.5.4.7
70		The system shall support the enabling or disabling of the ability to send an Echo Reply message in response to an Echo Request message sent to an IPv6 multicast or anycast address. (R)	
71		The system shall validate ICMPv6 messages, using the information contained in the payload, prior to acting on them. (R)	
72		If the system supports routing functions, the system shall support the OSPF for IPv6 as described in RFC 5340. (C)	
73	IPv6 Routing Functions	If the system supports routing functions, the system shall support securing OSPF with Internet Protocol Security (IPSec) as described for other IPSec instances in UCR 2008, Section 5.4. (C)	5.3.5.4.8
74		If the system supports routing functions, the system shall support OSPF for IPv6 as described in RFC 2740, router to router integrity using IP authentication header with HMAC-SHA1-96 with ESP and AH as described in RFC 2404, shall support OSPFv3 IAW RFC 4552. (C)	
75		If the system supports routing functions, the system shall support the Multicast Listener Discovery (MLD) process as described in RFC 2710 and extended in RFC 3810. (C)	
76		Engineering Requirements: Physical Media for ASLAN and non-ASLAN. (R) (Site requirement)	5.3.1.7.1
77	Site Requirements	Battery Back up two hours for non-ASLAN components and eight hours for ASLAN components. (R) (Site requirement)	5.3.1.7.5
78		Availability of 99.999 percent (Special C2), and 99.997 percent (C2) for ASLAN (R), and 99.9 percent (non-C2 and C2(R) for non-ASLAN. (R) (Site requirement)	5.3.1.7.6
79		Port-Based access Control IAW IEEE 802.1x. (R) Conditional for Core	5.3.1.3.2
80	IA Security requirements	Secure methods for network configuration. SSH2 instead of Telnet and support RFCs 4251-4254. Must use HTTPS instead of http, and support RFCs 2660 and 2818 for ASLAN and non-ASLAN. (R)	5.3.1.6
81		Security (R)	5.3.1.3.8
82		Must meet IA requirements IAW UCR 2008, Change 2, Section 5.4 for ASLAN and non-ASLAN. (R)	5.3.1.5

NOTE: All requirements are for core, distribution, and access layer components unless otherwise specified.

LEGEND:

AH	Authentication Header	HTTP	Hypertext Transfer Protocol	ms	millisecond
ASLAN	Assured Services Local Area Network	HTTPS	Hyper Text Transfer Protocol, Secure	MTU	Maximum Transmission Unit
C	Conditional	IA	Information Assurance	OSPF	Open Shortest Path First
C2	Command and Control	IAW	in accordance with	OSPFv3	Open Shortest Path First Version 3
C2(R)	Command and Control ROUTINE only	ICMP	Internet Control Message Protocol	PHB	Per Hop Behavior
CPU	Central Processing Unit	ICMPv6	Internet Control Message Protocol for IPv6	QoS	Quality of Service
DAD	Duplicate Address Detection			R	Required
DHCP	Dynamic Host Configuration Protocol	ID	Identification	RFC	Request for Comments
		IEEE	Institute of Electrical and Electronics Engineers	SHA	Secure Hash Algorithm
DHCPv6	Dynamic Host Configuration Protocol for IPv6	IPv4	Internet Protocol version 4	SLAAC	Stateless Auto Address Configuration
DISR	Department of Defense Information Technology Standards Registry	IPv6	Internet Protocol version 6	SNMP	Simple Network Management Protocol
		L2	Layer 2	SSH2	Secure Shell Version 2
		L3	Layer 3	SUT	System Under Test
DSCP	Differentiated Services Code Point	LACP	Link Aggregation Control Protocol	TCI	Tag Control Information
E2E	End-to-End	LAN	Local Area Network	UC	Unified Capabilities
ESP	Encapsulating Security Payload	LS	LAN Switch	UCR	Unified Capabilities Requirements
Gbps	Gigabits per second	Mbps	Megabits per second	VLAN	Virtual Local Area Network
HMAC	Hash-based Message Authentication Code	MPLS	Multiprotocol Label Switching	VPN	Virtual Private Network